PUBLIC HEARING

Reactive Chemical Hazard Investigation

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Chemical Safety and Hazard Investigation Board

May 30, 2002

Paterson, New Jersey

April 21, 1995
Napp Technologies, Lodi, NJ

Ed Hill, The Record
Rich Gigli, The Record

- Five onsite fatalities
- Some 300 evacuated
- Significant damage to the facility and surrounding businesses

April 8, 1998
Morton International, Paterson, NJ

KEY ISSUES:

- Internal Hazard Communication
- Reactive Hazard Management
- Process Safety Management

Hazard Investigation Objectives

- Evaluate the impacts
- Examine how OSHA and EPA address reactive hazards
- Analyze the National Fire Protection Association's reactivity ratings
- Examine non-regulatory standards and guidance
- Examine company policies, practices, testing, etc.
- Develop recommendations

Groups Involved To Date

- Academia
- Industry Trade Associations
- Labor Unions
- Public Interests
- Regulatory Agencies

Consultants and Reviewers

- ABS Consulting
- AD Little
- Baker Engineering & Risk Consultants
- Dan Crowl, Michigan Technological University
- Tom Seymour, Former OSHA Deputy Director of Safety Standards Programs

Definition: "Reactive Chemical Incident"

A sudden event

involving an uncontrolled chemical reaction

with significant increases in temperature,

pressure, and/or gas evolution

that has the potential to, or has caused,

serious harm to people, property or the environment.

Preliminary Conclusion # 1:

Reactive incidents are a significant safety problem.

- 167 incidents since 1980
- 108 fatalities
- 5 fatalities per year (average)
- 50 incidents with *public* impact

Severe Reactive Incidents

	Location	Date	Fatalities
1	Channelview TX	7/5/90	17
2	Charleston SC	6/17/91	9
3	Sterlington LA	5/1/91	8
4	Lodi NJ	4/21/95	5
5	Allentown PA	2/19/99	5
6	Port Neal IA	12/13/94	4

Severe Reactive Incidents

	Location	Date	Fatalities
7	Auburn IN	6/28/88	4
8	Gulfport MS	6/2/82	3
9	Barceloneta Puerto Rico	6/12/86	3
10	Belpre OH	5/27/94	3
11	West Helena AR	5/8/97	3
12	Augusta, GA	3/13/01	3

Other Notable Recent Incidents

Location	Date	
Pennington AL	1/23/02	2 Fatalities
Pasadena TX	6/23/99	2 Fatalities
Bucks AL	9/4/99	1 Fatality
Whitehall MI	6/4/99	1 Fatality
Pasadena TX	3/27/00	1 Fatality

Preliminary Conclusion # 2:
Gaps in worker safety regulations

There are significant gaps in safety regulations designed to protect workers from the hazards of reactive chemicals.

(Preliminary Conclusion # 2)
Gaps in safety regulations

- Over 50 percent of incidents *involved chemicals that are not covered* by OSHA process safety regulations

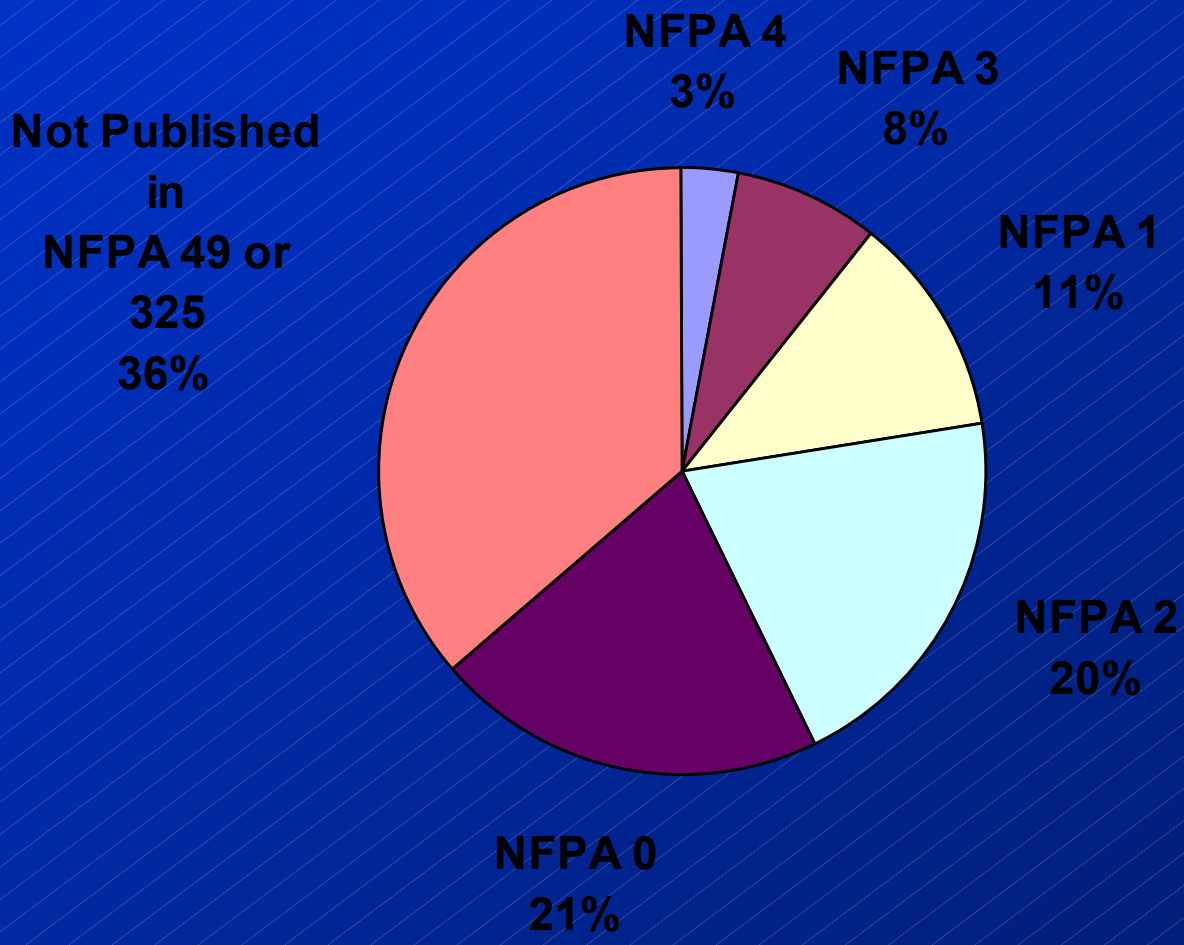
OSHA's Process Safety Management

- Primary regulation is OSHA's Process Safety Management -- the PSM Standard
- It covers individually listed chemicals & a class of flammables

(Preliminary Conclusion # 2) National Fire Protection Assn. Ratings

Rating	Definition
4	Capable of detonation or explosive decomposition or reaction at normal temperatures and pressures
3	Capable of detonation or explosive decomposition or reaction with a strong initiating source or heat under confinement
2	Undergoes violent chemical change at elevated temperatures and pressures
1	Normally stable except at elevated temperatures and pressures
0	Normally stable, even under fire conditions

(Preliminary Conclusion # 2) National Fire Protection Assn. Ratings



Preliminary Conclusion # 3: Limitations of NFPA ratings for PSM

- Ratings not designed for process safety
- Ratings use subjective criteria and judgment
- Chemical combinations not addressed
- Process conditions not addressed
- PSM-listed reactive chemicals were taken from a limited list of 325 chemicals

Preliminary Conclusion # 4: Gaps exist in regulations protecting the public

Safety regulations designed to protect the public have significant gaps in the coverage of reactive hazards.

Preliminary Conclusion # 4: Gaps exist in regulations protecting the public

- Over 60 percent of incidents involved chemicals not covered by these EPA process safety regulations.

Preliminary Conclusion # 4: Gaps exist in regulations protecting the public

- The primary regulation is EPA's Risk Management Program (RMP) rule.
- EPA states it could not identify or develop criteria for listing reactive chemicals

February 19, 1999
Concept Sciences, Inc.
Allentown, PA

Tom Volk, *The Morning Call*

- Five Fatalities
- Multiple Injuries
- Extensive damage, including surrounding buildings

Preliminary Conclusion # 5: Reactive hazards are diverse

The reactive problem is not adequately defined by simply placing chemicals on a list. The problem is too multi-faceted.

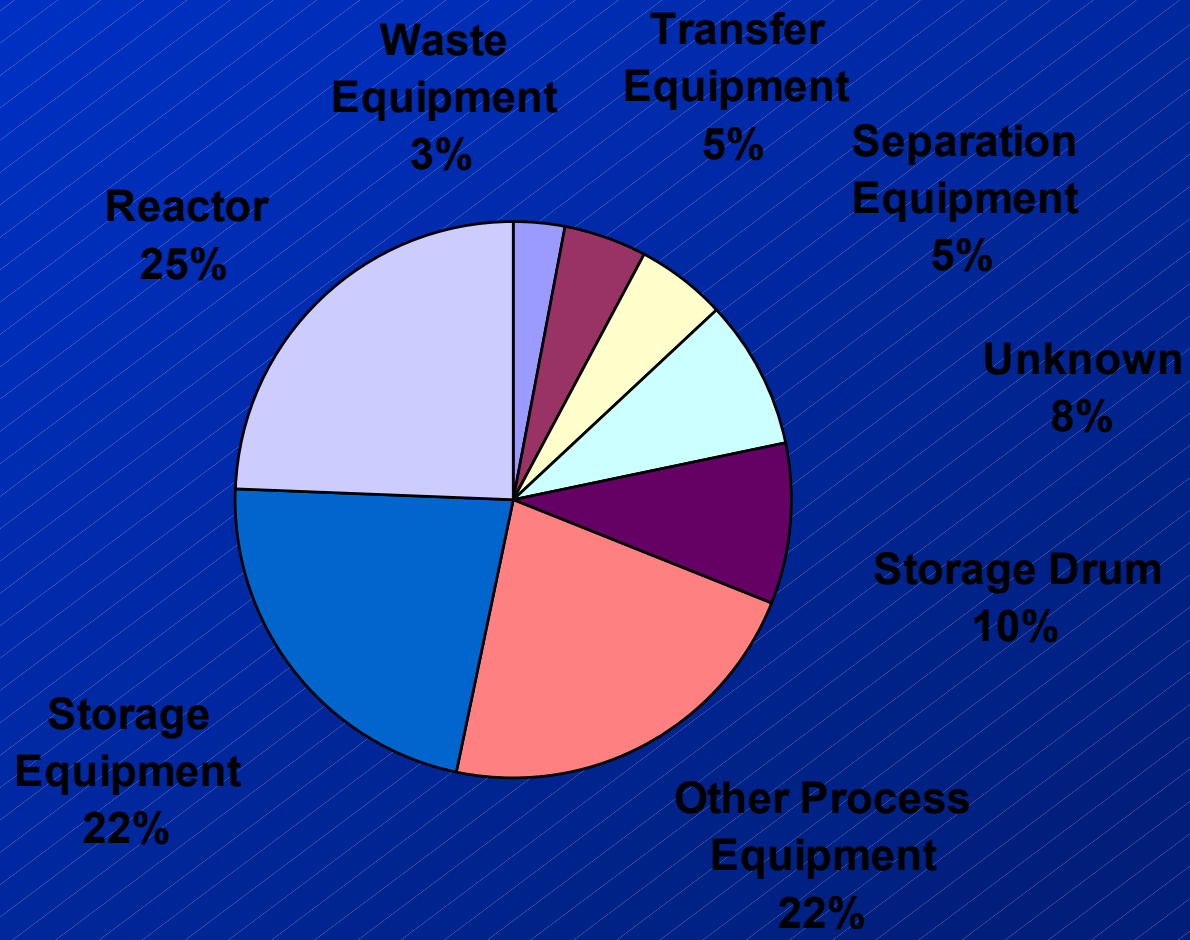
- **All chemicals can be reactive**
- **Hazards arise from interactions in specific conditions of a chemical process**
- **Reactivity can result in an energy release or a toxic release**

June 4, 1999
Whitehall Leather Company
Whitehall, MI

Lisa Medendorp, *The Chronicle*

- One fatality
- One injury
- 11 employees evacuated

Equipment where reactive incidents happen



Preliminary Conclusion # 6:

Incidents occur in many industries

Reactive incidents are not unique to the chemical manufacturing industry

Type of Facility	Percent of Incidents
Chemical Manufacturing	70% +
Storage, Handling, Consumer Sites	Nearly 30%

May 8, 1997
Bartlo Packaging Inc.
West Helena, AR

Rick McFarland, *Arkansas Democrat-Gazette*

- 3 Fatalities
- 17 Injuries
- Significant Damage
- Hundreds Evacuated
- Mississippi River and Major Roads closed to traffic for 12 hours

Preliminary Conclusion # 7:
The reactive problem is diverse

This requires regulators and industry to address the hazards of chemicals and their combinations under specific process conditions.

It is more important to manage reactive chemistry than to focus on individual chemicals.

Preliminary Conclusion # 8:
Sources of data on reactive incidents are inadequate

Existing sources of incident data are not adequate to identify the number, severity and causes of reactive incidents.

- No comprehensive source of chemical incident data
- OSHA and EPA data is not designed to identify and track reactive incidents
- Available data very limited in terms of lessons-learned and root cause information

Preliminary Conclusion # 9:
Unrecognized hazards lead to incidents

Reactive incidents often caused by inadequate recognition and evaluation of reactive hazards.

- **This occurred in 60 percent of incidents with some causal information**
- **50 percent involved inadequate work procedures.**

March 13, 2001
BP Amoco
Augusta, GA

- Three fatalities
- Uncontrolled reaction
- Material obstructs all vessel inlets and outlets
- Pressure build up in vessel
- Workers attempt to remove vessel lid
- Lid rips off relieving pressure

Preliminary Conclusion # 10:

Industry not adequately obtaining existing knowledge

Existing knowledge of reactive hazards is not being effectively applied.

- Over 90 percent of the 167 incidents had reactive hazard information that was documented in literature
- Some of the tools available
  - Brethericks' Handbook of Reactive Chemical Hazards
  - NOAA – The Chemical Reactivity Worksheet
- Reactive chemical test data generally not shared.

Preliminary Conclusion # 11:
Industry guidelines not complete

Industry's voluntary good-practice guidelines for managing reactive hazards are limited and not complete.

- American Institute of Chemical Engineers' Center for Chemical Process Safety (CCPS)
- American Chemistry Council (ACC)
- The Synthetic Organic Chemical Manufacturer's Association (SOCMA)
- National Association of Chemical Distributors (NACD)

Preliminary Conclusions - Summary

- Reactive incidents are a significant safety problem.
- There are gaps in safety regulations for reactive hazards.
- It is not possible to identify all reactive incidents using existing data sources.
- Reactive hazards are not adequately defined by lists of individual substances.

Preliminary Conclusions - Summary

- Chemicals and their combinations must be considered under process-specific conditions.
- Many reactive incidents could be prevented by applying knowledge that already exists about the hazards.
- Industry's voluntary good-practice guidelines need to be improved.

Considerations for Today's Panels:

- OSHA's PSM standard: need to improve coverage?
  - What criteria could be used for classifying mixtures?
  - Need minimum regulatory requirement for hazard evaluation?
  - Any alternative regulatory approaches?
- Processes already under OSHA-PSM: Should requirements be changed or added?
- EPA's RMP regulation: sufficient or not, and what should be added or changed?
- Should OSHA & EPA take non-regulatory actions to reduce the number and severity of reactive chemical accidents?

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